RESEARCH ARTICLE

A retrospective analysis of the effect of subcutaneous columellar strut graft on the nasal tip

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Abstract

Objective: To assess the function of the columellar strut, and to evaluate its effect on the nasal tip.

Method: The retrospective study was conducted from April to June 2022 at Al-Twifiq Private Hospital, Salaheddin Governorate, Iraq, and comprised data of patients who underwent closed septorhinoplasty between January 2021 and March 2022. Preoperative and 9-month postoperative imaging was used to follow up on those who required columella strut.

Results: Of the 64 patients who underwent closed septorhinoplasty, 46(71.9%) received subcutaneous columellar strut; 32(69.6%) females and 14(30.4%) males with mean age 25±4.6 years (range: 19-41 years). The mean columella-labial angle preoperatively was 87.29±18.34 (range: 75-93o), and postoperatively it was 105.91±29.21 (range: (98-113o) (p<0.05.). Mean nasal tip projection before the operation was 0.59±0.19 (range: 0.48-0.62), and postoperatively it was 0.63±0.23 (range: (0.54-0.66) (p<0.05.). The appearance of the columellar show was corrected in 42(91.3%) patients.

Conclusions: Subcutaneous columellar strut resulted in a distinct projection line of the nasal tip, increased rotation of the nasal tip, and correction of columella show. The graft placement via the subcutaneous route was found to be a simple and easy way with only a few disadvantages.

Keywords: Columellar strut, Columella show, Closed septorhinoplasty, Nasal tip projection, Nasal tip rotation.

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Introduction

The columella is a structure that links the tip of the nose to the base of the nose, and separates the nares. It is an important structure that maintains the support of the nasal tip. The columella is compromised in most rhinoplasty operations.[1] Aesthetically, it carries great importance for the dorsum or nasal tip[2] and has a role in the nasal function in addition to cosmetic significance.[3] The maintenance of nasal tip support in rhinoplasty is important to achieve long-lasting good outcomes of septorhinoplasty. The columellar strut graft technique is used frequently for nasal tip support and shape, with the graft increasing nasal tip projection, rotation, and definition.[4-6] The source of graft used is usually autologous cartilage harvested from the nasal septum, auricle or costal cartilage. In rhinoplasty, the most important and difficult determinant of long-lasting positive outcomes has been the maintenance of nasal tip support. It is a popular and effective form of an invisible graft in rhinoplasty, where the graft is inserted between the medial crura and sutured, it can be used in both endonasal (closed) rhinoplasty and external (open) rhinoplasty. Other approaches used for columellar graft insertion include the transcutaneous columellar strut where the graft is inserted through a vertical incision made on columella,[7,8] also called the percutaneous columellar strut.[9]

The sub-labial approach for the reconstruction of columellar collapse is done by the insertion of the cartilaginous graft via an incision made in the upper gingiva-buccal sulcus to avoid cutting the frenulum (inverted V-shaped incision). The columella strut graft in a study was placed in a tunnel between the medial crura of the lower lateral cartilages and the membranous septum.[10]

In subcutaneous columella strut technique, an incision is made through the columellar site to create a pocket anterior to the medial crura, and the strut graft is placed through it and securely held in place with suture material. The current study was planned to evaluate the effect of subcutaneous columellar graft on the nasal tip.

Materials and Methods

The retrospective study was conducted from April to June 2022 at Al-Twifiq Private Hospital, Salaheddin Governorate, Iraq, and comprised data of patients who underwent closed septorhinoplasty between January 2021 and March 2022. Data, including patient photographs before and after the surgery, was collected from institutional archives.

A detailed history was taken with the clinical and endoscopic examination of the ear nose and throat (ENT), and a proper assessment of the external nose was done. Standard photography for rhinoplasty included frontal, left

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and right lateral profile, and base views of the patient's face were captured for postoperative assessment. The study excluded data of patients with previous septorhinoplasty (revision rhinoplasty). All operations had been performed under general anaesthesia (GA), and informed consent was obtained during the treatment phase.

The sample size was calculated using the equation:

$$n = \frac{Z2\,[P\,(1-P)]}{E2}$$

$$\cong 69$$

In the formula, Z was the standard deviation at a confidence level of 95% which was 1.96, P was the proportion of septorhinoplasty performance (0.05), and E was the margin of error (0.05) in line with a study done in Iran.[11]

During surgery, the columella strut was harvested from the nasal septal cartilage under GA. It measured 12-20mm in length, 3-6mm in width, and 1-2mm in thickness, and had carefully curved edges to ensure optimal characteristics. It was important to ensure that the dimensions of the strut graft did not exceed the boundaries of the medial crura, and that it was moulded to avoid any noticeable irregularities that could impact the appearance.

The insertion of the strut using dissecting forceps with serrated jaws was done through a marginal incision made on the columella, creating a cavity in front of the medial crura to achieve nasal augmentation. This groove extended from the tip of the nose to the anterior nasal spine continuously along the base of the nose. It was recommended to position the graft 1-2mm above the nasal tip. The marginal incision was closed by using a 5/0 vicryle suture, followed by securing the skin with a subcutaneous strut with a 5/0 proline suture. The sutures were removed after 5-7 days (Figure 1).

Figure-1: The placement of subcutaneous columellar strut. Using dissection forceps, the strut graft was inserted through the columellar site of marginal incision in a pocket created anterior to the medial crura.

Preoperative photographs and photos taken 9 months after the surgery were compared to document the morphological changes in nasal tip rotation, tip projection and the columella. Any drawback of using the subcutaneous columella strut was also noted.

To evaluate nasal tip rotation, the angle of the columellar-labial was measured. This angle was determined by drawing a line from the most outward point of the columella to the subnasal region, and another parallel line from the subnasal region to the superior labial region, perpendicular to the first line. The columellar-labial angle was expected to fall within the range of 90°-105° for males and 95°-110° for females.[12]

Goode's alignment is considered a reliable indicator of nasal tip projection. It involved measuring the length of a line from the alar groove to the nasal tip (A-T). It was

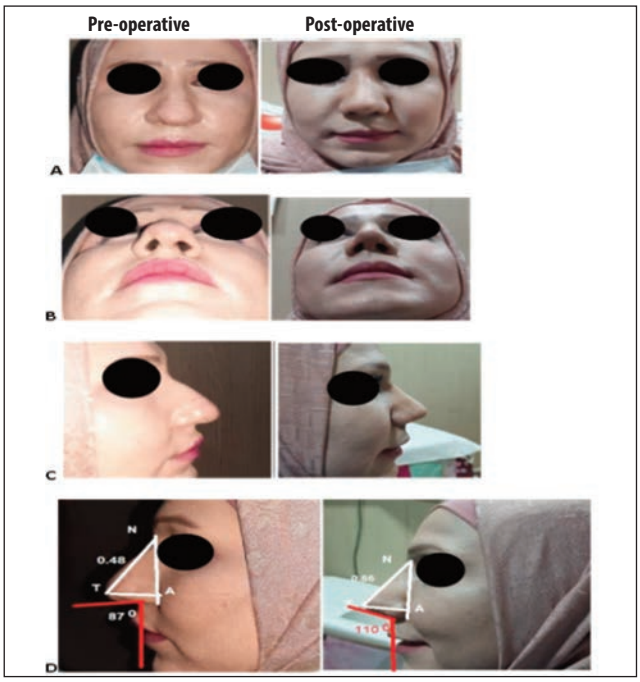

Figure-2: A 28-year-old female with bulbous nasal tip and thick skin. Pre and post-Operative photo (A) frontal view. (B) Basal view. (C) Right lateral view. (D) Left lateral view. (N=Nasion, T=Nasal Tip, A=Alar groove.) D: Pre-operative (The nasal tip rotation was 87°, tip projection 0.48, with retracted columella and hanging ala.) D: Post-operative (The nasal tip rotation became 110°, tip projection 0.55, with normal columella definition).

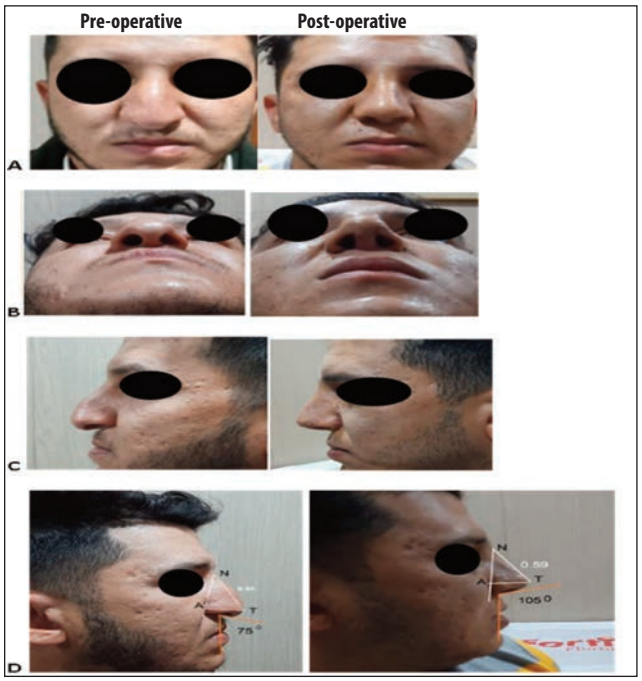

Figure-3: A 30-year-old male with collapsed nasal tip (Droopy nose.) Pre-operative and post-operative photo (A) frontal view. (B) Basal view. (C) Left lateral view. (D) Right lateral view. (N=Nasion, T=Nasal Tip, A=Alar groove.) D: Pre-operative (The nasal tip rotation was 75°, tip projection 0.54, with retracted columella and hanging columella.) D: Post-operative (The nasal tip rotation became 105°, tip projection 0.59, with normal columella definition.

followed by drawing a perpendicular line that was tangent to the alar groove. The ratio of the length at the front of the face to the distance between the nose tip (T) and nasion (N) had to be 0.55-0.60 times (N-T)(Figures 2-3).[13,14]

The term 'columnellar show' referred to the space between the columella and the end of the nostril. The assessment began by measuring the downward length from the columella, which is the area between the nose and its base, and the measurement was taken at the centre of the nose. It has been defined as a retraction or hanging of the columella, which is not visible when it is <2mm and visible when it exceeds 2mm, and is also referred to as the type of columellar visibility.[12,15]

Data was analysed using Excel 2010. Data was expressed as frequencies and percentage, or as mean±standard deviation, as appropriate. P<0.05 was considered significant.

Results

Of the 64 patients who underwent closed septorhinoplasty, 46(71.9%) received subcutaneous columellar strut; 32(69.6%) females and 14(30.4%) males with mean age 25±4.6 (range: 19-41 years).

Indications for the use of columellar strut were noted (Table 1).

Table-1: Indications for the columellar strut (n=46).

Nasal abnormalities	n (%)*
Bulbous tip with thick skin	32 (69.6)
Retracted columella	23 (50)
Collapse (drooping) nasal tip	15 (32.6)
Split (bifid) columella	4 (8.7)

*More than one nasal abnormality was noted in several patients.

Table-2: Preoperative and nine months postoperative results of nasal tip projection and tip rotation.

Time	Naso-columella angle (nasal tip rotation)		nasal tip projection	
	Pre- operative	Nine months post-operative	Pre- operative	Nine months post-operative
Minimum (degree)	75 0	980	0.48	0.54
Maximum (degree)	930	1130	0.62	0.66
Mean (degree)	87.29±18.34^0	105.91±29.21^0	0.59±0.19^0	0.63±0.23^0

Table-3: Preoperative columellar show abnormalities and postoperative correction.

Columellar show abnormalities	n (%)	Corrected abnormalities (%)	Persistent abnormalities (%)
Retracted columella	23 (50)	23 (100)	Nil
Retracted columella +Hanging ala	14 (30)	12(86)	1(25)
Hanging ala	5 (11)	4 (80)	1(20)
Hanging columella	4 (9)	3 (75)	2(14)
Total	46 (100)	42 (91.3)	4(8.7)

Table-4: The disadvantages of subcutaneous columella strut.

Complications	n (%)
Excessive nasal show (Hanging columella)	1(2.2)
Columellar stiffness	2 (4.3)
Prominent graft	1 (2.2)
Widening of the columella	Nil
Graft mobility or columellar deviation	Nil
Total	4(8.7)

The mean columella-labial angle preoperatively was 87.29±18.34 (range: 75-93^0), and postoperatively it was 105.91±29.21 (range: (98-113^0) (p<0.05.). Mean nasal tip projection before the operation was 0.59±0.19 (range: 0.48-0.62), and postoperatively it was 0.63±0.23 (range: (0.54-0.66) (p<0.05) (Table 2). The appearance of the columellar show was corrected in 42(91.3%) patients (Table 3).

The disadvantages of subcutaneous columellar strut were columellar stiffness, excessive nasal show and a prominent graft (Table 4).

Discussion

Subcutaneous strut in closed approach rhinoplasty has been used since 1953 when Goldman described the insertion of the cartilaginous graft through the columellar part of the marginal incision for correction of hidden columella.[6,16] The cartilaginous graft was inserted subcutaneously without fixation with a suture as a so-

called "floating graft".[17] It was opted to use sutures to close the incisions, based on the understanding that preserving the integrity of the columellar skin would provide sufficient stability for the graft without the need for additional stitch fixation.[18]

The subcutaneous columella strut is not always necessary to use in primary closed septorhinoplasty. The use of the columella strut graft in this study using closed rhinoplasty approach was 72%, which was less than in the open rhinoplasty approach where the columella strut is performed in almost all external (open) rhinoplasties.[6] If the tip support provided by the columellar incision is diminished, there is a risk of progressive columellar retraction, resulting in tip depression over time.[6] To prevent this, a columellar strut is implemented to maintain proper tip projection. In this approach, the columellar strut is placed anterior to the medial crura, and secured with sutures for fixation.[1,19]

The main indication for subcutaneous columellar strut in this study was in patients with thick (fatty) nasal skin (bulbous nasal tip) (70%). The nasal skin and its thickness play a role in the choice of graft. For patients presenting with traits such as a bulbous tip, indented area, thicker skin, short columella, low dorsum or wide base, the use of a strong cartilaginous strut with sufficient thickness and length is necessary. This strut is inserted by revising the lower cartilaginous nose septum sideways, resulting in improved tip projection, definition and support. The use of a strong graft avoids the loss of tip projection over time. In medium-thickness skin, the strut can be made from the mid-septum, and in the case of thin skin, it requires a carefully tailored strut as in cases of bifid tip and infratip lobule which results from thin skin that permits the lower lateral cartilage to show through. Retracted columella was the second indication for columella strut (50%) in the current study. The reasons for this might be a traumatic dislocation of the anterior cartilage and/or nasal bones, a fracture of the anterior cartilage, or a septal haematoma followed by septal resorption. This retraction alteration entails sagging of the area around the columella, and drooping of the anterior part of the nose.[13] This may develop into either more infratip lobules or a pointed nasolabial angle formed excessively. When such a case occurs, it requires the use of additional grafts that can be placed in the lowermost part of the columella superficial to medial crura.[16]

The method of subcutaneous columellar strut in primary closed rhinoplasty was found to be effective in increasing tip rotation, projection, and tip definition. Some studies have reported that the use of columellar strut graft in closed rhinoplasty resulted in increased postoperative nasolabial angle[20] and provided some increase in nasal tip projection.[8]

Although the open rhinoplasty method, based on inserting the graft between the medial crura, has been extensively studied, it is still not clear which technique will produce better results. Studies have consistently shown that the procedure of inserting a columellar strut graft does not have an essential or necessary role in rhinoplasty operations aimed at correcting nasal tip projection and/or rotation.[21-24] Maintaining or recreating the anatomical foundation of the nasal tip can achieve columellar integrity[22] reducing the need for columellar strut grafts. A 2019 study suggested that a columellar strut graft may help achieve a balanced nasal projection and maximal rotation compared to other considerations. Nasal tip projection is often decreased in cases of open rhinoplasty, which is a common desired change.[5]

Among the disadvantage currently noted, columellar stiffness was reported in 2(4.3%) patients. The stiffness usually settles out with time, and the swelling and firmness take months or years for the graft to soften. Another disadvantage is a prominent graft that may occur in patients with thin nasal skin, which requires a thin and careful tailor strut. Excessive columella show was reported in 1(2.2%) patient where the columella was pushed too far downwards. This happens when using a thick graft or the graft placed on projected infratip lobules. Trimming of the caudal edge of the medial crura is needed for the resting of the graft on the medial crura, and reducing slipping or movement of the graft and avoiding hanging columella.[4]

The increase in tip rotation, projection and definition of the nose helps determine the level e strut graft, among other procedures, has been effective in creating the observed results. The discussions are not limited to the utilisation of the strut graft, and encompass the entire surgical procedure. There are several techniques used, which include lateral crura trimmings, the lateral crural steal method, shortcut lateral crural overlaying, medialising medial crura footplates, removing the nasal hump, removing the caudal end of the nasal septum when needed, and implementing additional procedures, such as resectioning lateral crura bilaterally or submucous partial resection.[3,5]

The current study has limitations as the follow-up period was only 9 months, which excluded the possibility of assessing long-term outcomes. Future studies should compare subcutaneous columella strut technique with the method of placing the graft between two medial crura in closed approach rhinoplasty.

Conclusions

A columellar strut graft via the subcutaneous route was found to be a simple and easy way with only a few disadvantages.

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Author Contribution:

SHIAO: Data collection, analysis, interpretation, study design and drafting.

ASK: Data collection, analysis, interpretation, study design, revision and drafting.